Air Pollution Issues Affecting Electric Generating Units

The Clean Coal Study Group

April 6, 2006

Presentation Outline

- Health & Environmental Effects
- Ozone, Fine-Particles, Haze
- Clean Air Interstate Rule
- Control Options for Ozone, Fine-Particles and Haze
- Mercury

Health Effects

Ozone

- Decreased lung function
- Increased asthma attacks
- Depressed immune system
- Change in lung structure
- Potential premature death impact

Particulate Matter

- Premature death
- Decreased lung function
- Increased asthma attacks and chronic bronchitis
- Acute respiratory symptoms
- Respiratory and cardiopulmonary related hospital admissions
- Increased work and school absences

Mercury Health Effects

- Mercury is a threat to public health and unborn children are most at risk
- That risk is from exposure to low quantities of methyl mercury over time to mothers and their children primarily through consumption of fish
- Mercury is a neurotoxin and if present at sufficient levels can cause damage to the brain and central nervous system

Environmental Effects of Air Pollution

- Reduced visibility
- Reduced crop and forest yields
- Interference with ecosystems
- Acidification of lakes and streams
- Damage to buildings and materials

Ozone

What is ozone?

- Reactive Form of Oxygen
- Good Ozone and Bad Ozone
- VOC + NOx + Sunlight + Heat = Ozone
- Difficult Problem to Solve
  - Local Sources + State Sources + Interstate Transport Component

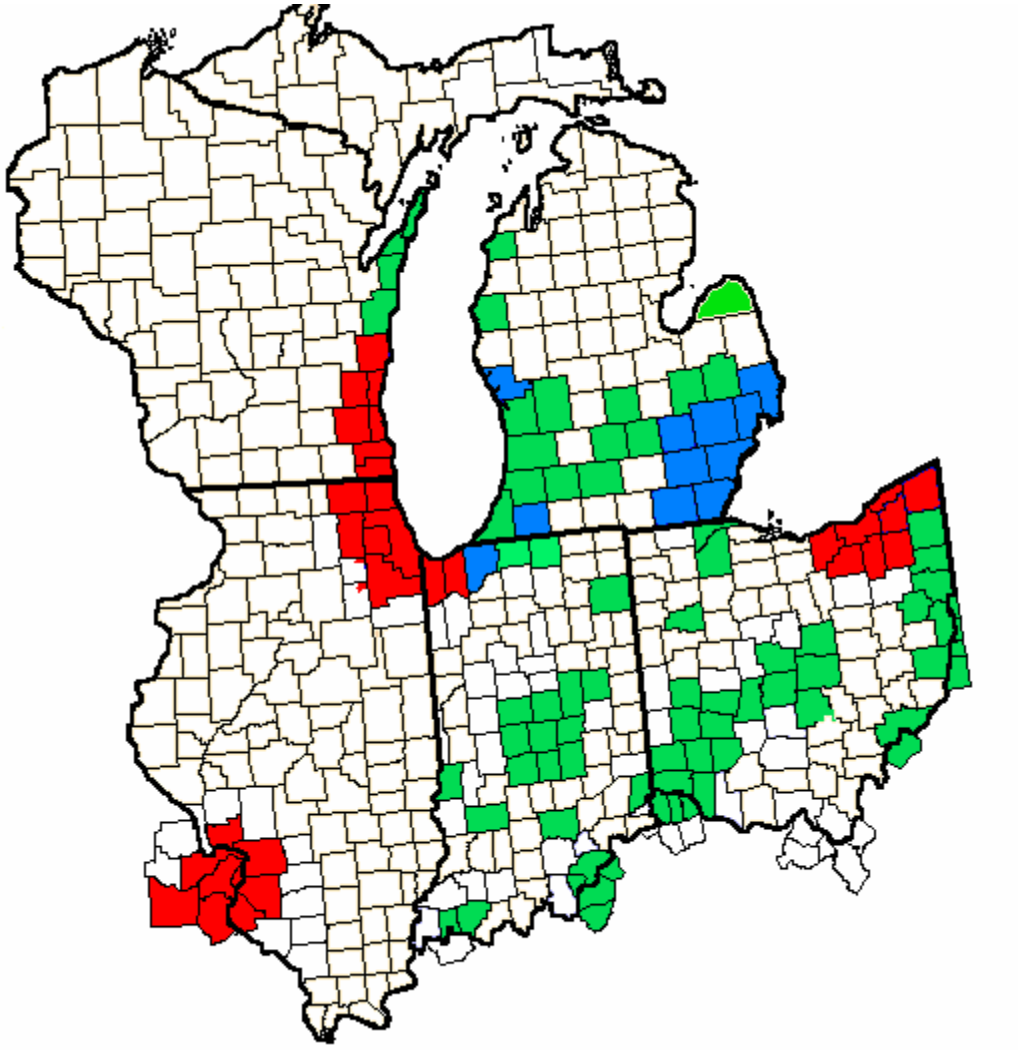
Region 5 Ozone Nonattainment Areas

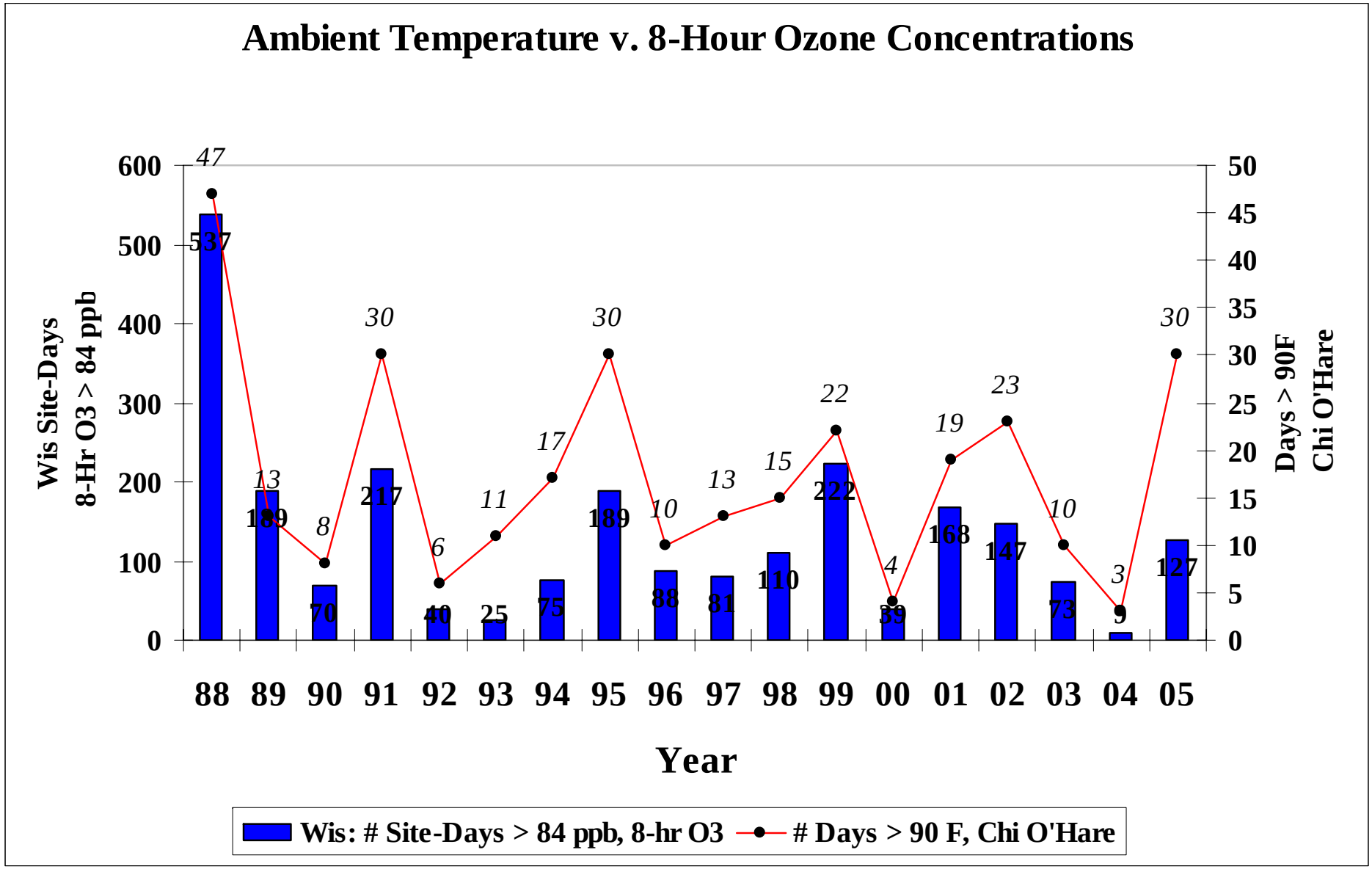
Moderate areas.

Marginal areas.

Subpart 1 or

“Basic” areas.




Ambient Temperature v. 8-Hour Ozone Concentrations
Wis Site-Days
8-Hr O3 > 84 ppb
Days > 90F
Chi O'Hare
600
500
400
300
200
100
0
50
45
40
35
30
25
20
15
10
5
0
47
13
8
30
6
11
17
30
10
13
15
22
4
19
23
10
3
30
537
189
70
217
40
25
75
189
88
81
110
222
39
168
147
73
9
127
88 89 90 91 92 93 94 95 96 97 98 99 00 01 02 03 04 05
Year
Wis: # Site-Days > 84 ppb, 8-hr O3
Days > 90 F, Chi O'Hare

Ozone

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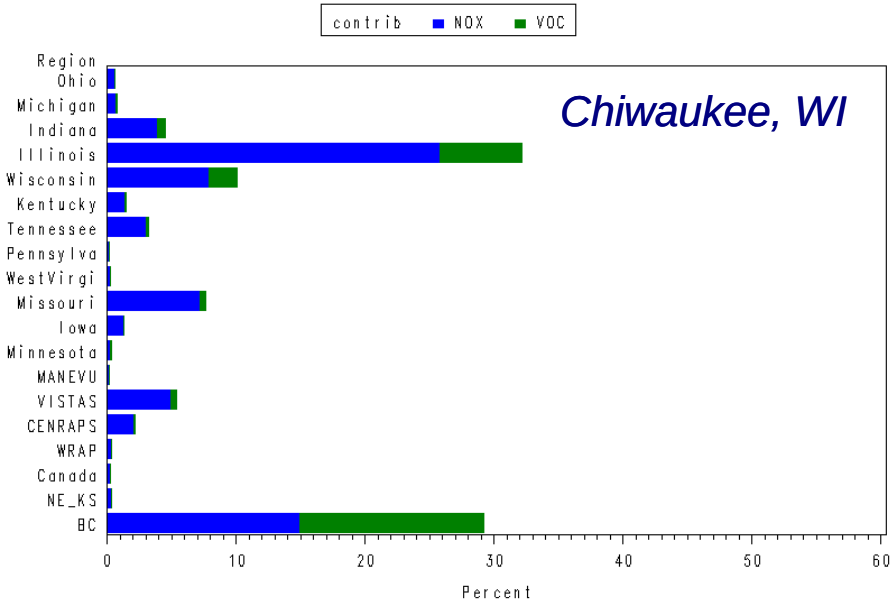

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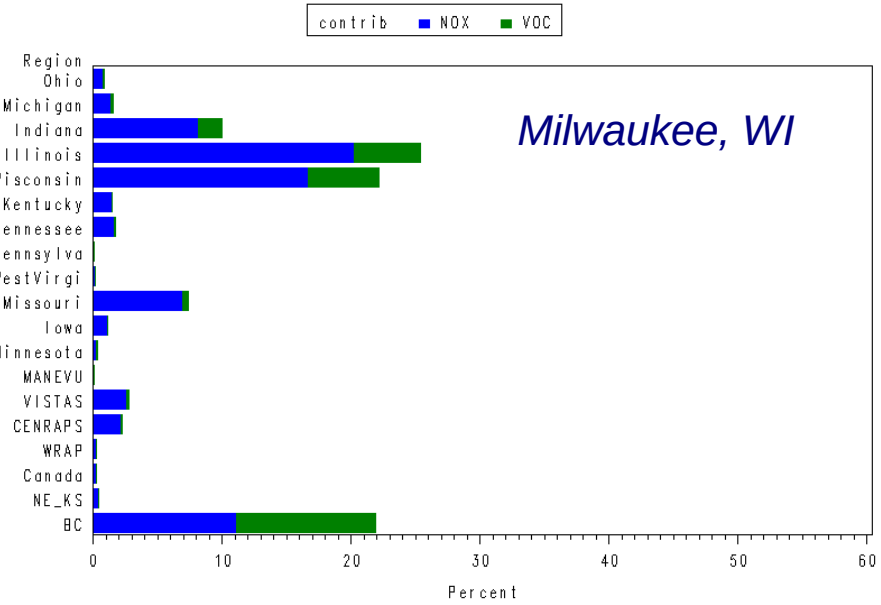

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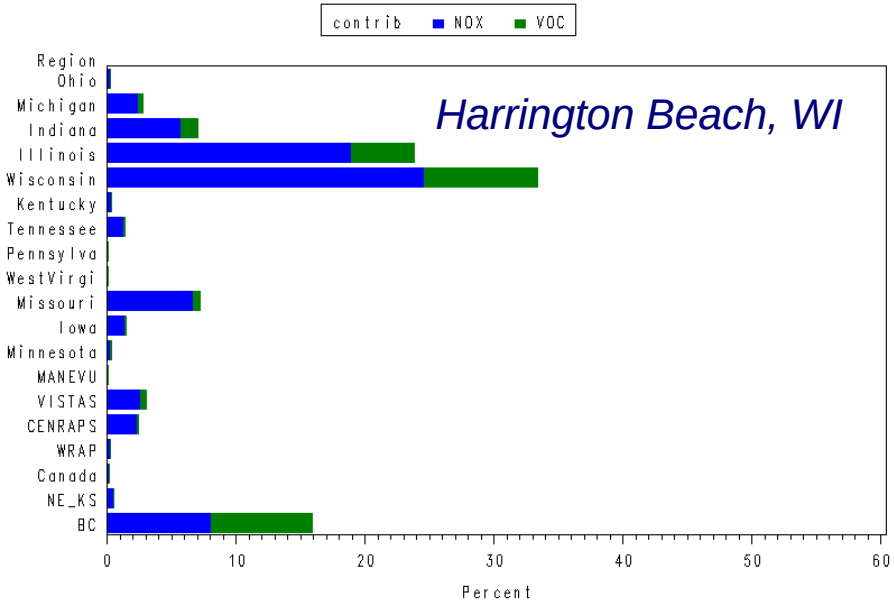

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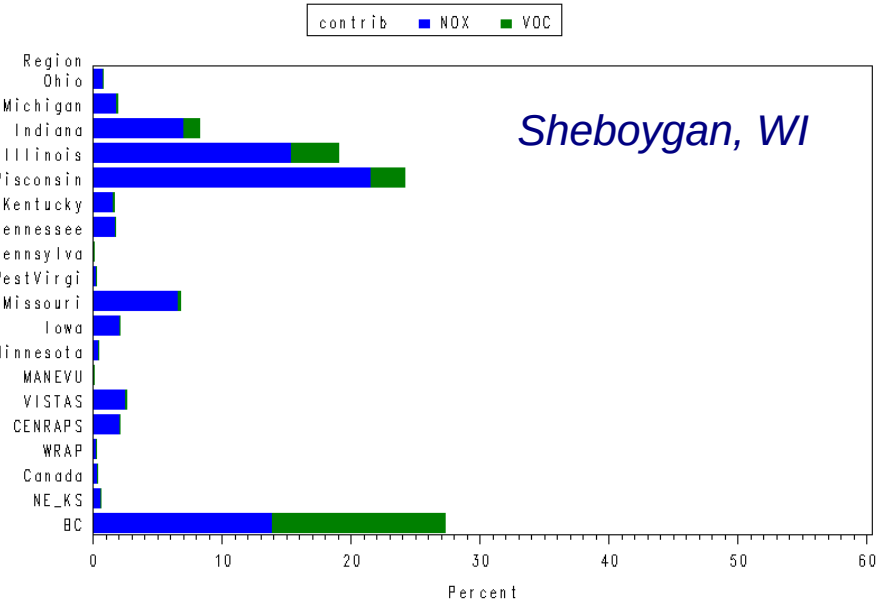


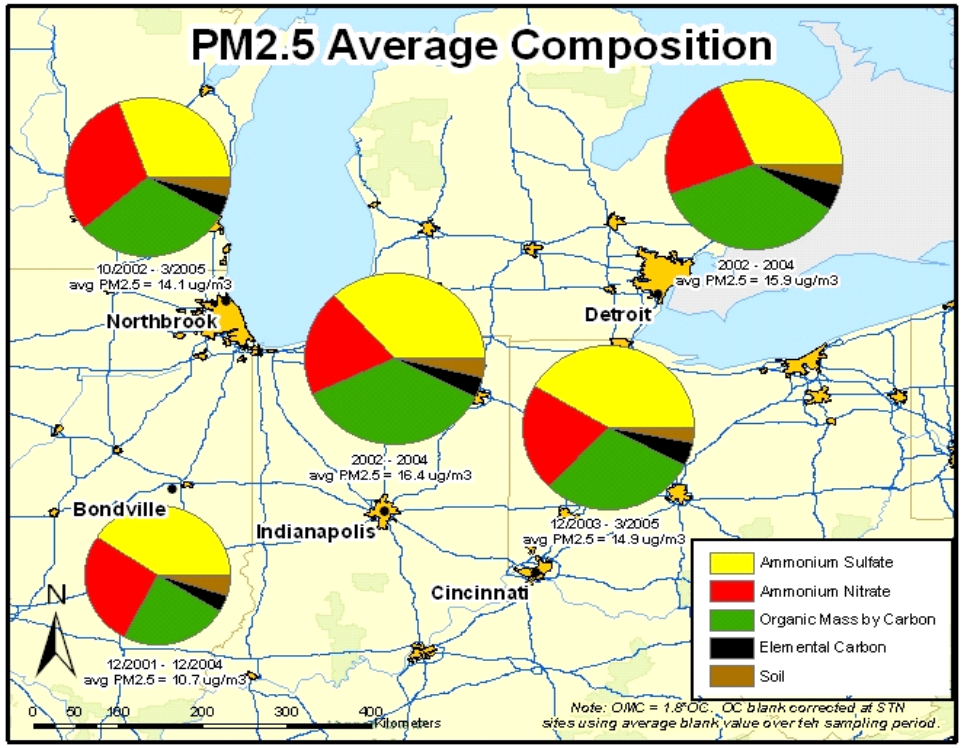
Ozone Schedule

- Reasonably Available Control Technology for Major Sources of NOx
  - Plan Due to EPA – September 2006
  - Hearing Authorization – Summer 2006
  - Rule Adoption – Late 2006
- Attainment Demonstration
  - Plan Due to EPA – June 2007
  - Hearing Authorization for Various Rules to Limit Emission of NOx and VOC – Late 2006 to Early 2007
  - Rule Adoption – Mid 2007

Fine-Particles (PM2.5)

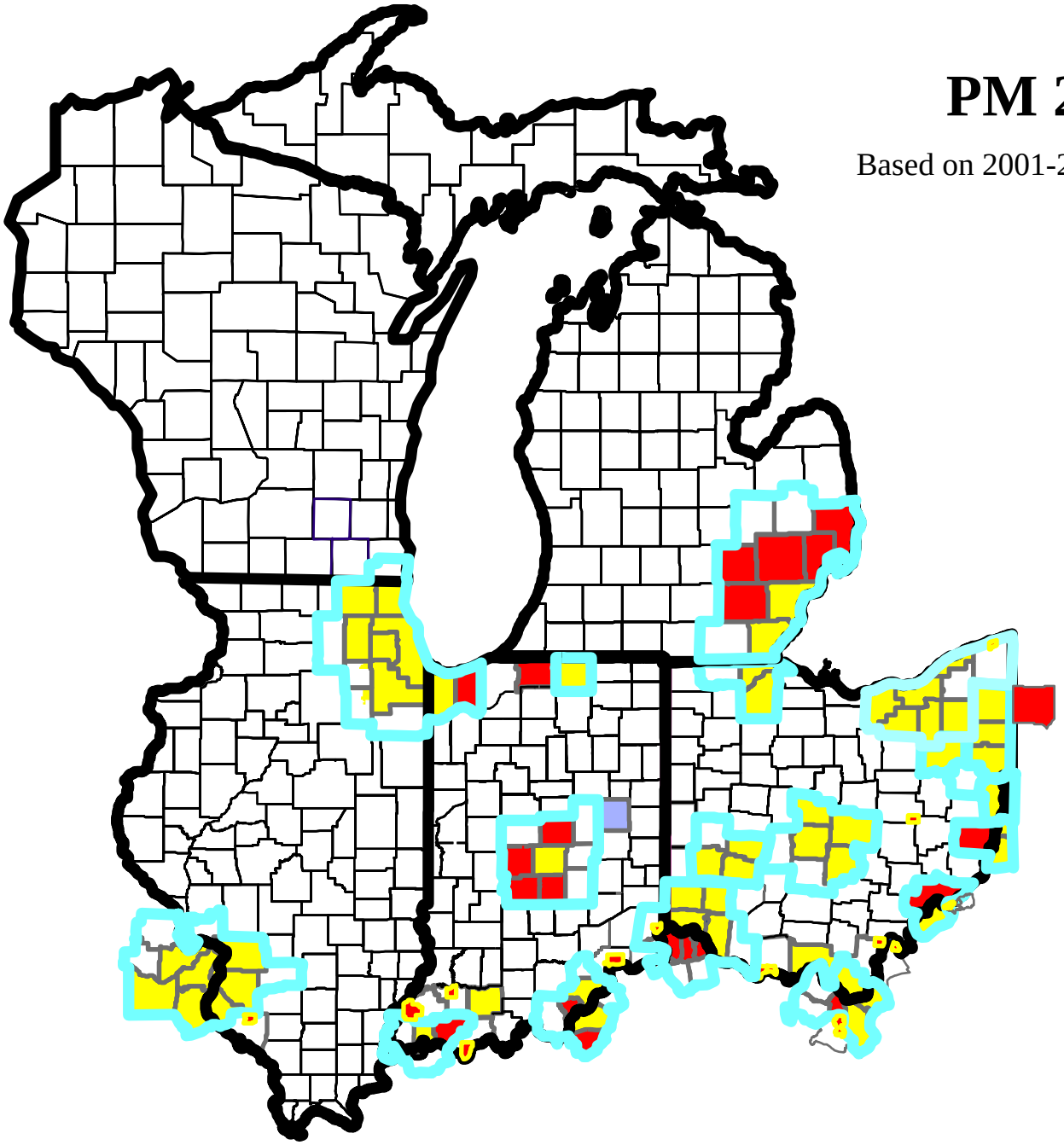
What are fine-particles?

- Solid or liquid particles in the atmosphere with a diameter less than 2.5 microns.
  - Ammonium Sulfate, Ammonium Nitrate, Elemental Carbon, Organic Carbon, Crustal Material
- PM2.5 Formation
  - Atmospheric Reactions of SO_2 and NOx with Ammonia to Form Ammonium Sulfate and Ammonium Nitrate
  - Elemental Carbon and Crustal Material Emitted Directly
  - Organic Carbon Formed by Both Atmospheric Reactions and Direct Emissions


PM2.5 Average Composition
10/2002 - 3/2005
avg PM2.5 = 14.1 ug/m3
Northbrook
2002 - 2004
avg PM2.5 = 15.9 ug/m3
Detroit
2002 - 2004
avg PM2.5 = 16.4 ug/m3
Indianapolis
12/2003 - 3/2005
avg PM2.5 = 14.9 ug/m3
Cincinnati
Bondville
12/2001 - 12/2004
avg PM2.5 = 10.7 ug/m3
N
0 50 100 200 300 400
Kilometers
Ammonium Sulfate
Ammonium Nitrate
Organic Mass by Carbon
Elemental Carbon
Soil
Note: OMC = 1.8*OC. OC blank corrected at STN sites using average blank value over teh sampling period.

Region 5
PM 2.5 Designations

Based on 2001-2003 Design Values and 9 factors



Attainment

State Recommended Nonattainment

EPA Recommended Nonattainment in addition to State Recommendation

Unclassifiable

Presumptive Area Boundary

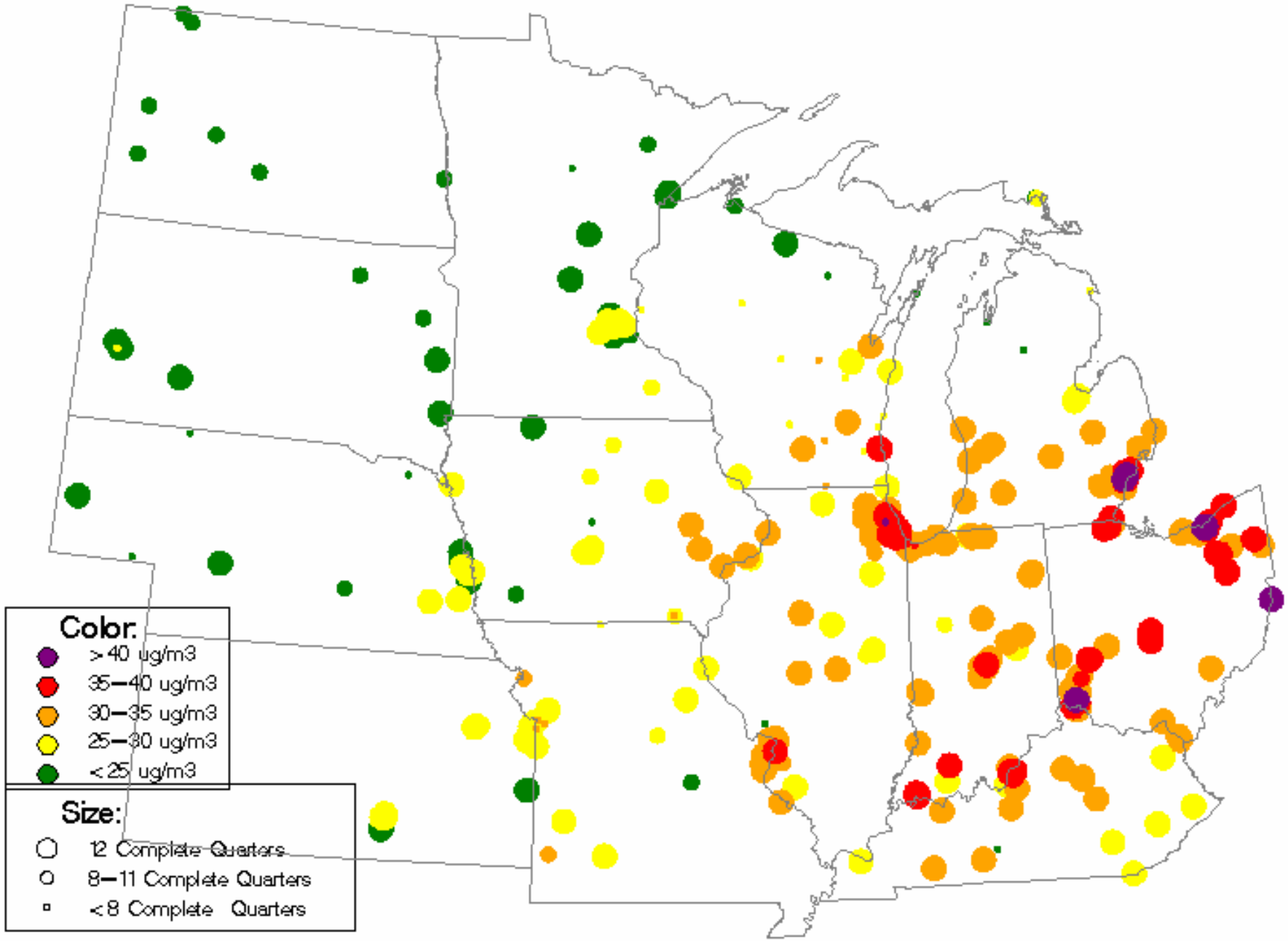
Fine-Particle Schedule

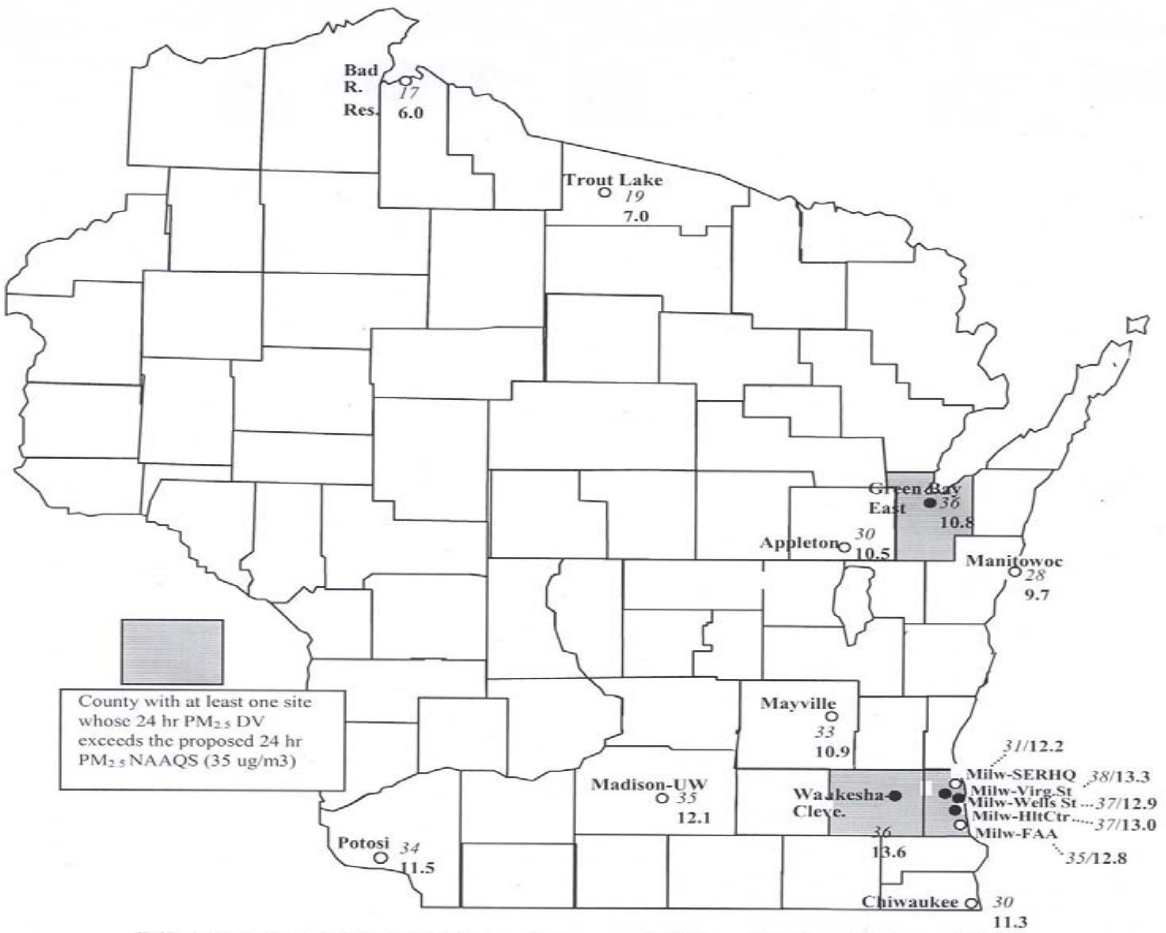
- No Attainment Demonstration is Necessary
- Regional Approach to Limit Transport – **Possible** Rules to Limit SO2 in Wisconsin in Exchange for NOx Control in Another State
  - Hearing Authorization – Early 2007
  - Rule Adoption – Mid 2007

What is EPA's proposal for the new particulate matter air quality standards?

- Fine Particles (PM2.5)
  - Annual Standard – 15 ug/m^3
  - 24-Hour – 35 ug/m^3 (Current Standard is 65 ug/m^3)
- Coarse Particles
  - 24-Hour – 70 ug/m^3
- Urban Visibility
  - 4-8 Hour PM2.5 Concentrations – 20-30 ug/m^3
- Standards Finalized – September 2006

PM2.5 FRM 98th Percentile Concentration, 2002–2004





DRAFT, Unofficial 24 Hr and Annual $PM_{2.5}$ Design Values (DVs)
Wis $PM_{2.5}$ FRM Monitoring Sites
2003-2005

Site legend

○ *24 hr $PM_{2.5}$ DV (ug/m3)*: 24 hr $PM_{2.5}$ national ambient air quality standard: 65 ug/m3

○ **Annual $PM_{2.5}$ DV (ug/m3)**: Annual $PM_{2.5}$ national ambient air quality standard: 15 ug/m3

● Site whose 24 hr $PM_{2.5}$ DV exceeds the proposed 24 hr $PM_{2.5}$ NAAQS of 35 ug/m3

WDNR Bureau of Air Mgmt 4 April 06

Haze

Haze or Visibility Impairment
Isle Royale National Park, Michigan

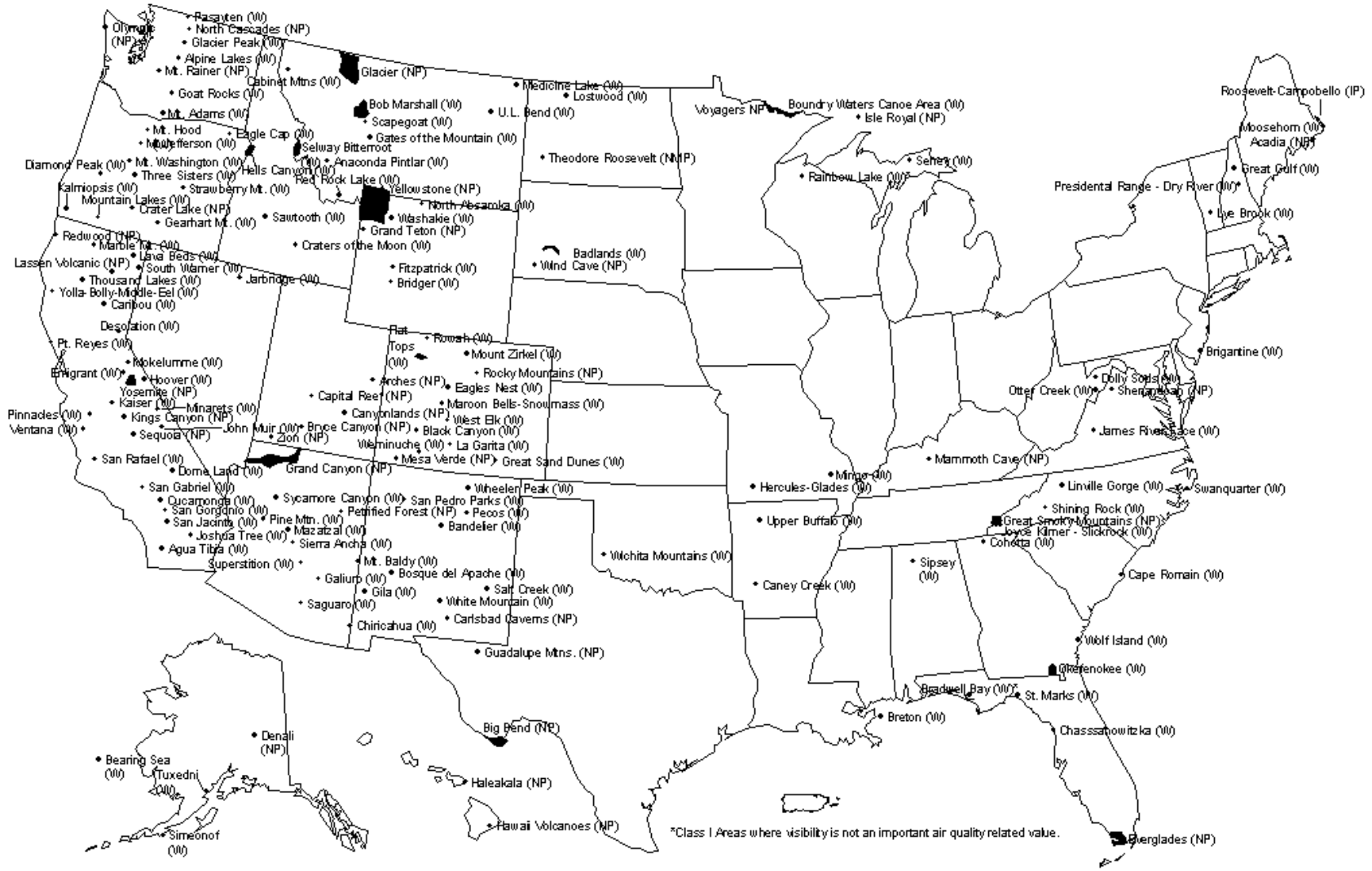
Good Day (dv = 7) **Bad Day (dv = 20)**

What is haze?

- Solid, Liquid, or Gases in the Atmosphere that Refract Light and Degrade Visibility
- Ammonium sulfate and ammonium nitrate are the largest contributors to visibility degradation

What are the basic CAA requirements for visibility in Wisconsin?

- EPA's Regional Haze Regulation
  - Protects Scenic Vistas in 156 Class 1 Areas in Country
  - No Anthropogenic Effect on Visibility by 2064
  - Reasonable Progress Deadlines (2018)
- There are no Class 1 areas in the State where visibility is an air quality related value.



Map of 156 National Park and Wilderness Areas Protected by EPA's Regional Haze Rule

Legend:
NP= National Park
W = Wilderness
IP = International Park

Haze Schedule

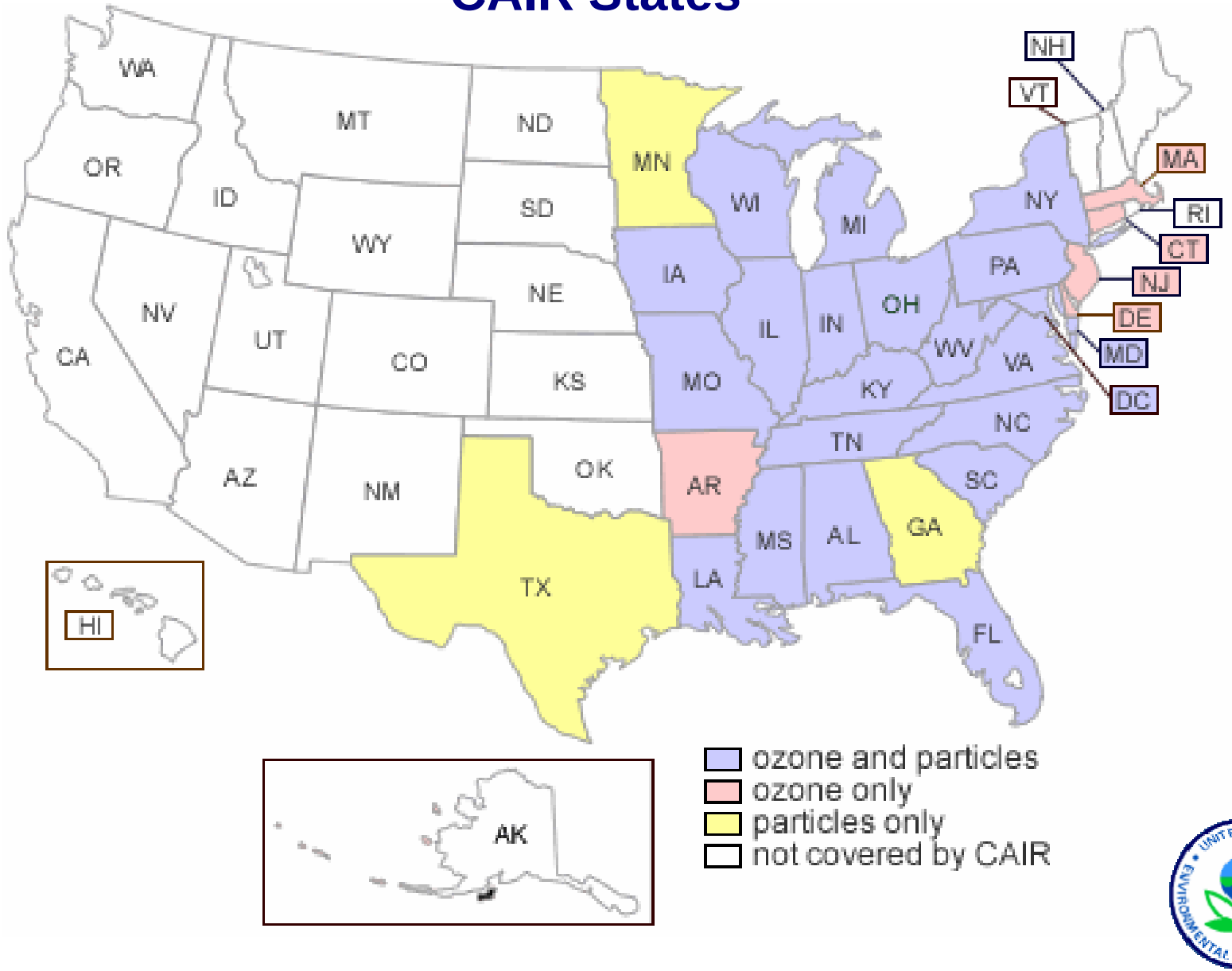
- Best Available Retrofit Technology (BART) for Several Major Industrial Sources and Several Power Plants
  - Hearing Authorization – Mid 2006
  - Rule Adoption – Late 2006
- Various Other Rules Limiting SO_2 and NOx Emissions to Meet Visibility Requirements
  - Hearing Authorization – Early 2007
  - Rule Adoption – Late 2007
  - Plan Due to EPA – January 2008

Interstate Transport of Pollutants

What is the CAIR?

- Clean Air Interstate Rule
- EPA Rule Requiring SO_2 and NOx Reductions from Power Plants in Eastern US
- EPA is strongly encouraging states to meet the rule requirements through Federal trading programs.

CAIR States


WA
OR
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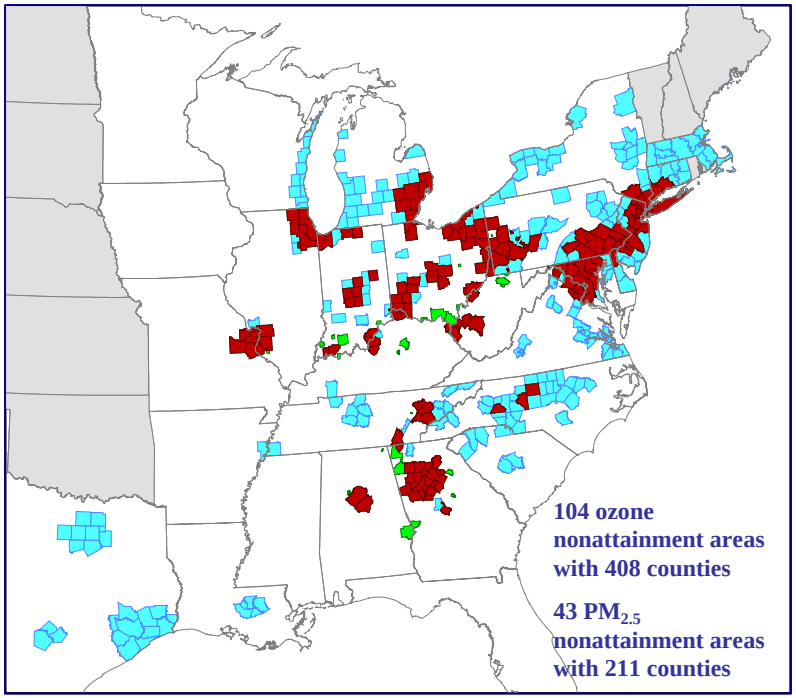
AL
OH
WV
GA
FL
SC
NC
VA
PA
NY
NH
VT
MA
RI
CT
NJ
DE
MD
DC
HI
AK
ozone and particles
ozone only
particles only
not covered by CAIR

Ozone and Particle Pollution: CAIR, together with other Clean Air Programs, Will Bring Cleaner Air to Areas in the East - 2015

Ozone and Fine Particle Nonattainment Areas (March 2005)

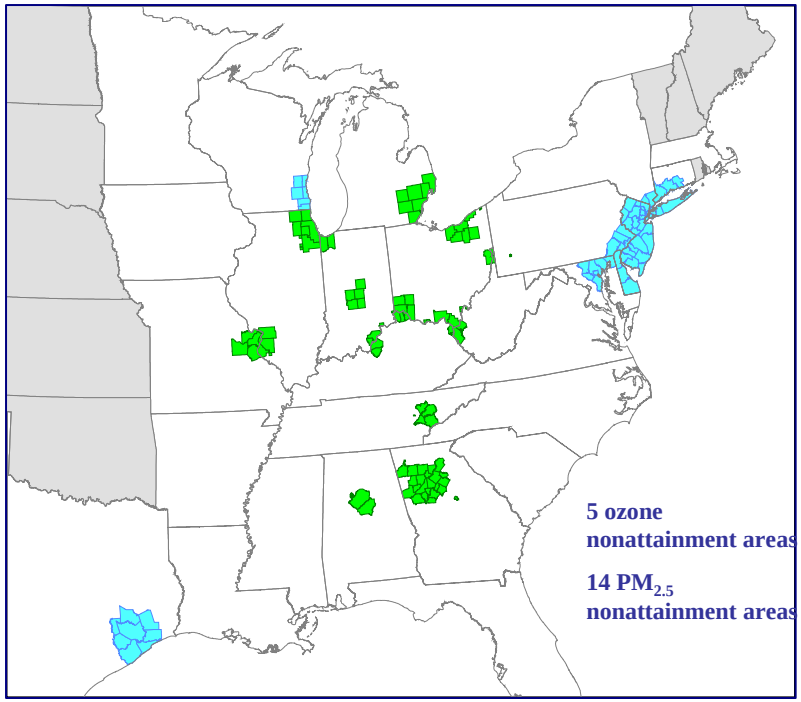


Nonattainment areas for 8-hour ozone pollution only

Nonattainment areas for fine particle pollution only

Nonattainment areas for both 8-hour ozone and fine particle pollution

Projected Nonattainment Areas in 2015 after Reductions from CAIR and Existing Clean Air Act Programs



Nonattainment areas in 2015 w/ CAIR and other programs for 8-hour ozone

Nonattainment areas in 2015 w/ CAIR and other programs for fine particle

CAIR Schedule

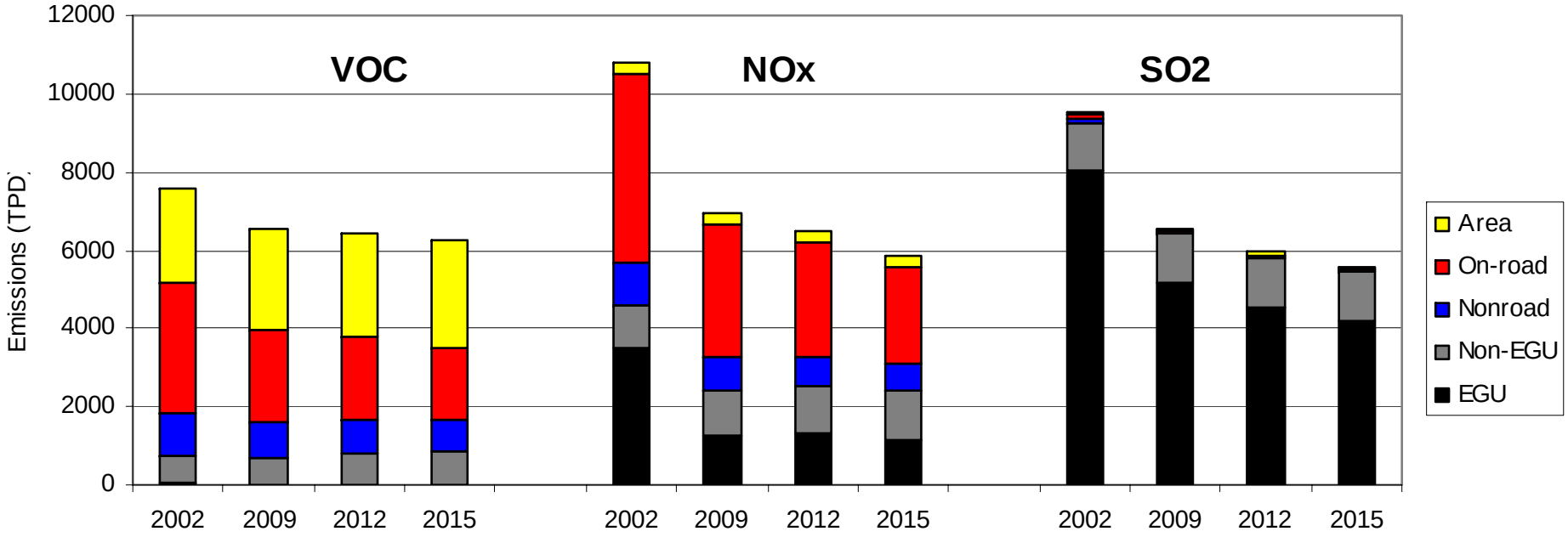
- State Administrative Rule to Implement CAIR in Wisconsin
  - Hearing Authorization – Mid 2006
  - Plan Due to EPA – September 2006
  - Rule Adoption – Late 2006

Control Options

Nomenclature

- EGU
  - Electric Generating Units or Power Plants Greater than 25 Megawatts
- Non-EGU
  - Large Industrial, Commercial or Institutional Sources: Foundries, Cement Kilns, Paper Mills, University Heating Plant, etc.
- Area Sources
  - Gas Stations, Home Water Heaters, Paints, Cleaning Agents, etc.
- Non-Road
  - ATVs, Chain Saws, Lawn Mowers, Motor Boats, Construction Equipment, Agricultural Tractors, etc.
- Highway Vehicles
  - Cars and Trucks

Precursor Emissions
LADCO Region



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Control Options: Summary

- Regional NOx reductions
  - Important given multi-pollutant benefits
  - Must include significant mobile source controls, which do not provide much reduction and are very expensive
- Local VOC reductions
  - Candidate area source measures get about 15%
- Local OC reductions
  - Difficult to achieve, given limited understanding of sources
- Regional SO2 reductions
  - May be necessary, given lack of sufficient NOx and OC reductions

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What if we do not comply with Clean Air Act requirements?

- Sanctions
  - Offsets and Highway Funds
- Federal Implementation Plan
- Sanctions occur 6 months after failure to submit the necessary plan.
- FIP may be coincident with sanctions.

Take-Home Messages

- There are significant health and environmental effects from exposure to ozone and PM2.5.
- We have made progress on ozone, but we have more to do.
- Watch for new particulate matter standards in September.
- We contribute to PM2.5 and ozone problems in other states.
- Electric utilities are a major players in ozone, PM2.5 and visibility impairment.
- We are working with other states on a comprehensive multi-pollutant approach.

Revisions to the State Mercury Rule

State Rule True-up Commitment – NR 446.029

- … the department shall adopt a similar standard that may not be more restrictive in terms of emission limitations.
- … including administrative requirements that are consistent with the federal administrative requirements (e.g. monitoring, recordkeeping and reporting).

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Federal Clean Air Mercury Rule Basics

- Each state assigned a state-wide mercury emission budget
- Each state required to submit a plan by November 2006 detailing the controls that will be implemented to meet their budget
- Mercury reductions in two-phases – 2010 and 2018

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Federal Clean Air Mercury Rule Basics - continued

- States are not required to adopt and implement the emission trading model rule EPA developed
- States are not prevented from requiring reductions beyond those set in their budget
- State budgets are a permanent cap regardless of growth thus state plans must include new units in their implementation requirements

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CAMR Comparison to State Rule

CAMR

- Electrical Generating Units Affected
  - 48 coal-fired boilers
  - operated by 8
  - different utilities
- Emission Cap
  - 2010 –1,780 pounds
  - 2018 – 702 pounds

State Mercury Rule

- Electrical Generating Units Affected
  - 36 coal-fired boilers
  - operated by 4
  - different utilities
- Emission Cap
  - 2010 – 1,670 pounds
  - 2015 – 696 pounds
  - 2018 – 557 pounds (goal)

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CAMR Legal Challenge

- Petitioners include 15 states (including Wisconsin), 5 environmental groups and 4 Tribes
- Key Issues - Delisting of power plants from federal list of significant HAP sources and specific provisions including interstate banking and trading
- August 2005 - Court denied petitioners request for CAMR implementation stay
- No decision has been reached

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Reconsideration of CAMR

- October 28, 2005, EPA granted petitions to reconsider delisting action and CAMR
- Separate action from legal challenge
- EPA identified issues, held a hearing and accepted comment until December 19, 2005
- No decision has been reached

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What Are Other States Doing to Address the CAMR?

- States have until November 2006 to provide EPA with a plan to meet the CAMR or face the possibility of a federal plan
- Currently 3 states have adopted rules with more stringent requirements
- More stringent laws or rules are being considered by 11 states
- Adoption of EPA's model rule is being proposed by 18 states

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What's Next?

- Continue to monitor legal challenge to CAMR and EPA's reconsideration
- Continue to evaluate public comments
- Draft rule and bring to NRB for hearing authorization in Fall 2006

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